

CLAIMS

1. A plating apparatus, comprising:

a plating tank for holding a plating solution;

5 a holder for holding a workpiece and bringing a surface to be plated of the workpiece into contact with the plating solution in the plating tank; and

10 a ring-shaped nozzle pipe disposed in the plating tank and having a plurality of plating solution injection nozzles for injecting the plating solution toward the surface to be plated of the workpiece held by the holder to supply the plating solution into the plating tank.

2. A plating apparatus according to claim 1, wherein streams

15 of the plating solution injected from the plating solution injection nozzles join each other on or in front of a substantially central area of the surface to be plated of the workpiece held by the holder.

20 3. A plating apparatus according to claim 1, wherein the plating apparatus comprises an electroplating apparatus having an anode, and a plating voltage is applied between the anode and the workpiece to perform electroplating on the workpiece.

25 4. A plating apparatus according to claim 3, further comprising a plating solution injection nozzle for injecting the plating solution toward the anode to supply the plating solution into the plating tank.

30 5. A plating apparatus according to claim 1, wherein the plating apparatus comprises an electroless plating apparatus for bringing an electroless plating solution into contact with the surface to be plated of the workpiece to perform electroless plating on the workpiece.

6. A plating apparatus according to claim 1, wherein the workpiece is disposed horizontally.

5 7. A plating apparatus according to claim 1, wherein the workpiece is disposed vertically.

10 8. A plating apparatus according to claim 1, wherein the nozzle pipe is shaped to extend along an outer profile of the workpiece.

15 9. A plating apparatus according to claim 1, wherein the nozzle pipe is movable relatively to the workpiece held by the holder.

10 10. A plating apparatus according to claim 1, wherein the nozzle pipe and/or the plating solution injection nozzles are made of an electrically insulating material.

20 11. A plating apparatus, comprising:
a plating tank for holding a plating solution; and
a stirring mechanism having a stirring vane immersed in
the plating solution in the plating tank and disposed in a position
facing a surface to be plated of a workpiece, the stirring vane
25 being reciprocally movable parallel to the surface to be plated
of the workpiece to stir the plating solution;
wherein the stirring vane has irregularities on at least
one side thereof.

30 12. A plating apparatus according to claim 11, wherein
the irregularities comprise a succession of triangular or
rectangular saw-tooth irregularities, or a number of narrow
grooves defined at predetermined intervals.

13. A plating apparatus according to claim 11, wherein the side of the stirring vane with the irregularities provided thereon faces the surface to be plated of the workpiece.

5 14. A plating apparatus according to claim 11, wherein the stirring mechanism has a plurality of the stirring vanes.

10 15. A plating apparatus, comprising:
a plating tank for holding a plating solution; and
a stirring mechanism having a stirring vane immersed in
the plating solution in the plating tank for stirring the plating
solution;
wherein the stirring vane comprises a plurality of stirring
vanes which are actuatable by respective independent drive
15 mechanisms.

16. A plating apparatus according to claim 15, wherein the stirring vanes are different in shape from each other.

20 17. A plating apparatus according to claim 15, wherein the stirring vanes are reciprocally movable in directions parallel to a surface to be plated of a workpiece.

25 18. A plating apparatus, comprising:
a plating tank for holding a plating solution; and
a stirring mechanism having a stirring vane immersed in
the plating solution in the plating tank and disposed in a position
facing a surface to be plated of a workpiece, the stirring vane
being reciprocally movable parallel to the surface to be plated
30 of the workpiece to stir the plating solution;
wherein the stirring vane has an angle with respect to
the surface to be plated of the workpiece, the angle being variable
as the direction in which the stirring vane moves is changed.

19. A plating apparatus according to claim 18, wherein the stirring mechanism has a plurality of the stirring vanes.

5 20. A plating apparatus, comprising:
a plating tank for holding a plating solution;
an anode immersed in the plating solution in the plating tank and disposed in a position facing a surface to be plated of a workpiece; and

10 a stirring mechanism for stirring the plating solution in the plating tank;
wherein the stirring mechanism has a first stirring vane disposed closely to the surface to be plated of the workpiece and a second stirring vane disposed closely to the anode.

15 21. A plating apparatus according to claim 20, wherein the first stirring vane is reciprocally movable parallel to the surface to be plated of the workpiece, and the second stirring vane is reciprocally movable parallel to a surface of the anode which faces the surface to be plated of the workpiece.